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15.1 GRADE SEPARATIONS

In general, there are three types of slope paving used at the abutments of bridges. Concrete cast-in-place is used in urban areas or where appearance is a prime consideration. Bituminous stabilized crushed stone or select crushed material is used in rural areas or where appearance is not as important. Refer to Standards 15.2 and 15.3 for Details.

Precast concrete blocks (approximately 4 x 16 x 24 inches (100 x 400 x 600 mm)) were the standard applications during the late 50's and early 60's. Many blocks settled or washed out of place due to erosion of bedding under the blocks. They are no longer specified except on widening jobs to match existing slope paving.

15.2 STREAM CROSSING

In general, due to the favorable performance and relatively low cost of geotextile fabrics, they are used under heavy riprap whenever heavy riprap is specified for a project. Heavy riprap is used for slope protection at stream crossings due to its superior performance over medium random riprap.

Many factors influence the criteria used to select end slopes. These include:

1. The type of soil. (granular, cohesive, borrow or in-situ)
2. Type and impact of a failure to stream/roadway/structure.
3. Type of abutment foundation support. (spread footings vs. piles)
4. Limited number of structures with high fills (> 20 feet).
5. History of the existing slopes at structure replacement sites.
6. Very limited number of existing end slope problems.
7. Additional bridge costs when structures are lengthened due to flatter slopes.
8. Observed failures have generally been deeper seated and not simply sloughing of the rip-rap.

With this background, use the following criteria.

Waterway Separation Structures: (Criteria based on vertical height of slope from toe to berm).

Vertical heights </= 20 feet: Use 1.5:1 slopes unless there are problems with the existing structure slopes. See 4 alternates following.

Vertical heights > 20 feet: If this is a replacement structure and there are no problems with the current slopes, employ current slope standards of 1.5:1.

For both waterway groups: If existing problems are noted or there is no historical information at the site, analyze site geometry and soils. If slope soil materials are “fairly granular”, use current standards. For other soil types, flatten slopes to 2:1.

We have experienced no problems relating to rip-rap sliding due to a slippage plane created by the underlying geotextile. There is a potential that a geotextile with a low flow rate may cause an unbalanced water head to develop during drawdown, but we have not experienced this either. Geotextiles placed below rip-rap appear to be working well to resist the removal/erosion of soil from the backfill and geotextile usage should be continued.

Refer to Standard 15.1 for placement of heavy riprap. Any additional riprap required is not part of the structure plans. Following is a description of applications:

Alternate 1 - Use for normal conditions of embankment fills. Normal conditions are when the berm is less than 2 feet (600 mm) above highwater since most bridges are designed with the highwater elevation close to the lower structural supports. This is a special case of Alternate 3. The riprap covers the berm and 1.5 to 1 slope in front of the abutment down to the streambed or slope intercept. Also, it wrapped around the fills on a 2.5 to 1 slope from the wing tips to the streambed or slope intercept, only if excessive scour is anticipated.

Alternate 2 - Apply for a channel change or clean-out condition. The riprap covers the berm and 1.5 to 1 slope in front of the abutment down to the streambed.

Alternate 3 - Use where berm elevation is less than 7 feet (2100) mm above highwater. The riprap covers the berm and 1.5 to 1 slope in front of the abutment down to the streambed or slope intercept. Also, it extends 3 feet (900 mm) beyond the edge of slab, then wraps around the fill 2 feet (600 mm) above highwater on a 2.5 to 1 slope from the wing tips down to the streambed or slope intercept, only at sites where excessive scour is anticipated.

| Alternate 4 - Apply where berm elevation is greater than 7 feet (2100 mm) above highwater. The riprap does not cover the berm. It starts 2 feet (600 mm) above highwater and covers the 1.5 to 1 slope in front of the abutment down to the streambed or slope intercept. Also, riprap is wrapped around the fills on a 2.5 to 1 slope from the wing tips down to the streambed or slope intercept, only at sites where excessive scour is anticipated.